11) Publication number:

0 226 472

#### **EUROPEAN PATENT APPLICATION**

(21) Application number: 86309723.4

② Date of filing: 12.12.86

(a) Int. Cl.4: **B60K 35/00** , F16H 1/445 , B60K 17/34, B60K 23/08

Priority: 13.12.85 JP 280662/85

19.03.86 JP 61801/86

19.03.86 JP 61802/86

24.03.86 JP 65314/86

18.04.86 JP 89347/86

06.05.86 JP 105468/86

08.05.86 JP 105542/86

30.05.86 JP 125197/86

24.06.86 JP 149079/86

09.07.86 JP 161298/86

- 43 Date of publication of application: 24.06.87 Bulletin 87/26
- Designated Contracting States: DE FR GB
- Box Date of deferred publication of the search report: 10.02.88 Bulletin 88/06

71) Applicant: TOYOTA JIDOSHA KABUSHIKI **KAISHA** 1, Toyota-cho Toyota-shi

Aichi-ken 471(JP)

Inventor: Nakamura, Yasunari

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

Inventor: Taga, Yutaka

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

Inventor: Kubo, Seitoku

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

Inventor: Kashihara, Yuji

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

Inventor: Morisawa, Kunio

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

Inventor: Takada, Mitsuru

C/o Toyota Jidosha K.K. 1, Toyota-cho

Toyota-shi Aichi-ken(JP)

(74) Representative: Ben-Nathan, Laurence Albert

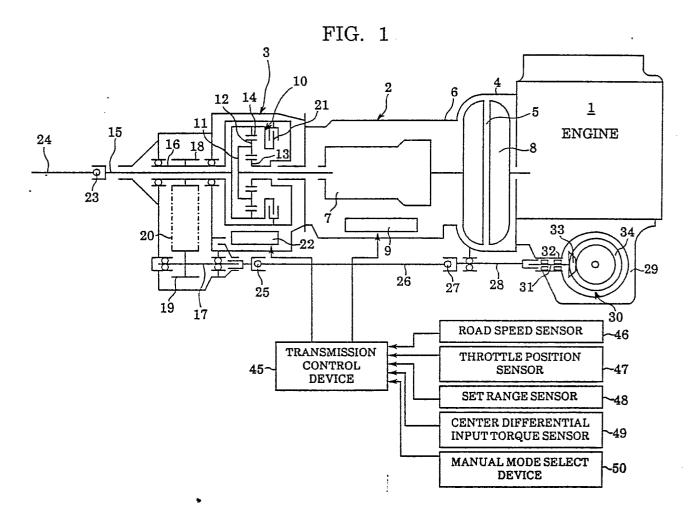
**C/O MICHAEL BURNSIDE & PARTNERS 2** 

Serjeants' Inn Fleet Street London EC4Y 1HL(GB)

Four wheel drive vehicle slippage control device and method limited center differential action according to input torque supplied thereto.

In a four wheel drive power transmission system for a vehicle, a power distribution device receives rotational power from an engine (1) and provides rotational power to the combination of the front wheels and also to the combination of the rear wheels, and is controllable either to provide differential action between the front wheels combination and the rear wheels combination, or for this differential action to be at least partially inhibited by torque transmission. This slippage control device (45) in-

cludes: a subsystem which estimates the torque (49) being input to the power distribution device for four wheel drive from the transmission mechanism; and a subsystem which provides differential action inhibition of the power distribution device according to the thus estimated value of the torque being input to it from the transmission mechanism. The method of operation of this device is also described.



## **EUROPEAN SEARCH REPORT**

	DOCUMENTS CONSI	Relevant	EP 86309723.4		
Category	* · · · · · · · · · · · · · · · · · · ·	ument with indication, where appropriate, of relevant passages		CLASSIFICATION OF THE APPLICATION (Int. Cl.4)	
Y	US - A - 4 538 70	00 (SUZUKI)	1,25	В 60 К 35/00	
	* Abstract; cl	.aim 1 *		F 16 H 1/44	
				B 60 K 17/34	
Y	US - A - 4 562 54	<u>1</u> (SAKAKIYAMA)	1,25	B 60 K 23/08	
	* Fig. 2; colu 42 *				
		•			
Α		.55 (S.I.R.P. STUDI ZZAZIONE PROTOTIPI			
	* Claims *				
	·	•			
Α	US - A - 4 549 44	18 (KITTLE)	1,25		
	* Totality *				
	·		TECHNICAL FIELDS SEARCHED (Int. CI.4)		
A	GB - A - 1 496 44 TRACTOR CO.)	7 (CATERPILLAR	1,25	В 60 К	
	* Totality *			F 16 H 1/00	
D	& JP-A-50-147 027			1 10 11 1/00	
A	EP - B1 - 0 043 2 K.K.)	237 (FUJI JUKOGYO	1,25		
	* Totality *				
D	& JP-A-57-15 019				
		-	1 05		
A	GB - A - 2 102 90 K.K.)	77 (FUJI JUKUGIU	1,25		
	* Totality *				
D	& JP-A-58-20 521	_			
	The present search report has b	een drawn up for all claims			
	Place of search	Date of completion of the search		Examiner	
	VIENNA	30-11-1987		DENK	
	CATEGORY OF CITED DOCU	E : earlier pa	itent documer	lerlying the invention nt, but published on, or	
Y: p	articularly relevant if taken alone articularly relevant if combined w ocument of the same category echnological background on-written disclosure	ith another D: documer L: documer	filing date nt cited in the a nt cited for oth	application	

# European Patent Office

### **EUROPEAN SEARCH REPORT**

-2-

DOCUMENTS CONSIDERED TO BE RELEVANT					EP 86309723.	
tegory		h indication, where approp ant passages	oriate,	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CI 4)	
A	<u>US - A - 4 298 08</u> * Totality *	35 (MOROTO e	t al.)	1,25		
D	& JP-A-55-72 420					
Α	<u>US - A - 4 566 55</u> * Totality *	54 (SUZUKI)		1,25		
D	& JP-A-59-206 228					
Α	PATENT ABSTRACTS mined application 8, no. 284, Decement PATENT OFFICE MENT page 57 M 348	ns, field M, nber 26, 198	vol. 4	1,25		
	* Kokai-no. 59	9-151 661 *			TECHNICAL FIELDS	
D	& JP-A-59-151 661	L .			SEARCHED (Int. Cl.4)	
A	PATENT ABSTRACTS mined application 9, no. 42, Februa	ns, field M,		1,25	-	
	THE PATENT OFFICE MENT page 165 M 359	E JAPANESE G	OVERN-			
	* Kokai-no. 59	9-184 025 *				
D	& JP-A-59-184 025					
	The present search report has b	een drawn up for all claims	•			
Place of search Date of complete		Date of completion	of the search		Examiner	
	VIENNA	30-11-	1987		DENK	
Y : pa	CATEGORY OF CITED DOCL articularly relevant if taken alone articularly relevant if combined w ocument of the same category chnological background on-written disclosure	ith another D	after the filli after the filli document of document of	nt document, ng date cited in the ap cited for other	lying the invention but published on, or plication reasons ent family, corresponding	



### **EUROPEAN SEARCH REPORT**

-3-

•	DOCUMENTS CONSI	EP 86309723.4			
Category		indication, where appropriate, intipassages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)	
•	PATENT ABSTRACTS (mined application)	s, field M, vol.	1,25		
	THE PATENT OFFICE				
	page 29 M 448				
	* Kokai-no. 60	<b>-</b> 176 827 *			
D	& JP-A-60-176 827				
		-			
				TECHNICAL FIELDS SEARCHED (Int. Ci.4)	
	,				
	The present search report has h	een drawn up for all claims			
The present search report has been drawn up for all claims  Place of search Date of completion of the sear				Examiner	
		30-11-1987		DENK	
Y : p	CATEGORY OF CITED DOCL particularly relevant if taken alone particularly relevant if combined we document of the same category	E : earlier pa	principle unde tent document iling date t cited in the a t cited for othe	rlying the invention i, but published on, or pplication ir reasons	
A : to O : n P : u	echnological background non-written disclosure ntermediate document	ent family, corresponding			